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PHYSICAL SCIENCE A HUNDRED YEARS AGO.

Humphry Davy, Poet and Philosopher. By T. E. Thorpe, LL.D., F.R.S. (Century Science Series.) Pp. 240. (London: Cassell and Co, Ltd., 1896.)

THE time is now fast approaching when people will be reckoning up the achievements of the closing century. Undoubtedly the great characteristic of the times in which we and our fathers and grandfathers have lived is the enormously rapid advance which has been made in our knowledge of the earth itself and of the forces of nature. Middle-aged people can remember the time when trains were much less frequent and rapid, the telegraph a rather expensive luxury, and when telephones were not. If they happen to have crossed the ocean in a modern "liner," or have heard of what can be done with modern explosives, or chance to have fallen into the hands of the modern surgeon or physician armed with anæsthetics, antiseptics and hypnotics fresh from the laboratory of the synthetical chemist, they are ready to acknowledge that things are greatly changed since their young days. But it is only after the perusal of such a book as this, that the ordinary reader comes to realise that all these things are not belated inventions which ought to have been given to us sooner, but that the very foundations of all physical science were hardly laid a hundred years ago. If we try to sum up the position in 1796, we find that though some advance had been made in theoretical mechanics and dynamics, there was very little knowledge about heat, light, electricity, or chemistry. It was known, for example, that if sulphur, glass, or sealing-wax was rubbed, or bits of zinc and copper immersed in salt and water, sparks and shocks could be got out of the arrangement, but up to 1800 the phenomena of electrolysis were wholly unknown, and not till even later were the magnetic properties of the current discovered The "corpuscular" theory of light held its own till the early days of the nineteenth century, and "caloric" was still regarded as a sort of matter which could enter into chemical combinations, and could be squeezed out of bodies like water from a sponge. Chemistry at the same time was only just emerging from the disorder attending the dying struggles of the phlogistic doctrine, and even the Lavoisierian system, which had taken its place, was disfigured by many errors which could only be rectified by a long series of experiment more exact than anything which had ever before been possible.

This was broadly the state of physical science when Davy appeared upon the scene. Black and Cavendish were elderly men whose active work was over, and Priestley was ending his days in a distant land. England was at war with France, and there were no chemists of great note in the Germany of that day. This was also long antecedent to the time when chemical and physical laboratories for instruction existed in the universities or elsewhere, and the young Davy owed his introduction to physical science and his opportunities for study, as so many of the past generations of chemists and "natural philosophers" have done, to his association with medicine. Born in Penzance in 1778, he was apprenticed, at the age of seventeen, to an apothecary and surgeon practising in that far western country town where his father's family had been settled since the days of Elizabeth. Here, with no other guide than Lavoisier's "Elements of Chemistry," he set to work, and in the course of little more than a year he had made such progress, and at the same time such a reputation, as to obtain release from his indentures on his appointment as assistant to Dr. Beddoes at the new Pneumatic Institution at Bristol. In less than two years from this time we find him receiving the offer of a post at the Royal Institution in London, then newly started on its career under the influence of Count Rumford.

The story of Davy's rapid progress towards fame is in its main features familiar to the majority of educated Englishmen, but probably few persons have hitherto so completely realised, as will the readers of this book, the poetic element in Davy's character, and the large share it had in determining his choice of associates, as well as the extent to which it appears to account for the quality of some of his scientific work, and the vivacity and ardour with which he pursued his discoveries. Apparently Davy only missed being a writer of poetry in consequence of the attractions of the laboratory, and to speak of him as "poet and philosopher" is to do him no injustice. So early as 1799, soon after his arrival in Bristol, his friend Mrs. Beddoes introduced him to her sister, Maria Edgworth, and to Southey and S. T. Coleridge, with whom the acquaintance ripened into a warm friendship. Not many years later we find him in the company of Scott and Wordsworth in the lake country, and with the former, at any rate, the intimacy was sustained.

Concerning Davy's scientific work, there will perhaps always be some difference of opinion as to the relative merits of his various discoveries. Some may incline to think the isolation of the metals from the alkalis the most important; while others consider the completeness, both experimental and logical, of his inquiry into the nature of oxymuriatic acid (chlorine), which resulted in the establishment of the elemental character of this substance, entitle it to be regarded as his most perfect scientific achievement.

The invention of the safety lamp is, of course, in the popular idea Davy's greatest title to fame; but while undoubtedly the establishment of the principle of its construction represents an important service to science, it seems surprising that he should not himself have introduced some of the, rather obvious, improvements which were made soon after his time by practical men with the object of removing some of the defects of the lamp in its original form, as a protection against the dangers of the mine, and of which Davy must himself have been aware. The claim that was put forward by George Stephenson is discussed fairly in the book, and disposed of justly.

Davy was, of course, much fascinated by the "galvanic phenomena," and it is therefore remarkable that he should have said so little concerning the *arc*, which he was probably the first to observe, and of which he ultimately gave a good description. But there is no

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detailed account of this wonderful phenomenon in the successive Bakerian Lectures and other papers, in which he communicated to the Royal Society the results of his numerous experiments with the battery, and only in his "Chemical Philosophy," published in 1812, is it referred to specifically. To us who live so long after, and who enjoy advantages arising directly or indirectly out of Davy's work, it seems strange that the poet, in his nature, did not supply the prophetic insight which was wanting in the philosopher.

The existence of two previous biographies of Davy—the one by Dr. Paris (1831), and the other by his brother John (1840), by no means render this new "Life" superfluous. The book has characteristics and charms of its own which ought to make it popular, and it is to be hoped that the remarkable collection of letters referred to in the preface may wholly or in part find its way into print, as the letters serve to throw an interesting light on the personality of the remarkable man by whom they were written, or to whom they were addressed, as well as on many interesting events of the time.

In reading carefully through the book two statements are to be found, which, as they are matters of fact, ought not to be matters of dispute. The author will forgive us, therefore, for drawing his attention to points in which we believe that he is misinformed.

It is true that Northmore obtained chlorine in a liquid state before this was accomplished by Davy and Faraday; but it was not by "heating the so-called hydrate of chlorine under pressure" (p. 149). Northmore used a brass condensing syringe and pear-shaped glass receivers in his experiments, and there can be no doubt that he liquefied chlorine by mechanical compression (*Nicholson's Journal*, xiii., 1806, p. 234.)

The other is a point of somewhat greater interest. On p. 126 the statement occurs that "Lavoisier never hazarded any conjecture as to the nature of potash and soda." This, however, is apparently irreconcilable with the following passage, which will be found in Lavoisier's "Collected Works," vol. i. p. 119, and which it would seem that Dr. Thorpe must have overlooked or forgotten: "L'analogie pourrait porter à croire que l'azote est un des principes constituants des alkalis en général, et on en a la preuve à l'égard de l'ammoniaque comme je vais l'exposer, mais on n'a, relativement à la potasse et à la soude que de légère présomptions, q'aucune expérience decisive n'a encore confirmées." This passage appears, of course, in Kerr's translation of the "Élémens," and a footnote is there added by the translator to the effect that, from experiments made in Germany, there is reason for supposing that soda is a modification of magnesia, and that the latter seems to be a metallic oxyd. The experiments referred to are obviously inconclusive; but, in discussing them a few pages later, Mr. Kerr makes the statement that these discoveries, if confirmed, "have been in great measure predicted by the conjecture of Mr. Lavoisier, who supposes that those substances which have long been considered as primitive earths are only metallic oxyds combined with oxygen, and that their reduction has hitherto been prevented by the attraction which subsists between them and oxygen being stronger than that between oxygen and carbon."

The translator explains in his "advertisement," at the beginning of the book, that the "new edition of the original having appeared at Paris last winter, expectations were formed that the author might have made considerable improvements; but from a correspondence with Mr. Lavoisier, the translator is enabled to say that the new edition is entirely a transcript from the former. Some very material additions, though not numerous, have been added by the translator in this edition relative to certain discoveries which have been made in some parts of chemistry since the publication of the original." From all this it appears certain that Lavoisier thought at one time that azote was a constituent of potash and soda. He may have changed his mind later, and have communicated his altered views to Mr. Kerr, but he does not seem to have put them upon record in any other way.

W. A. T.

EGYPTIAN MADE EASY.

An Egyptian Reading Book for Beginners: being a Series of Historical, Funereal, Moral, Religious and Mythological Texts printed in Hieroglyphic Characters, together with a Transliteration and a Complete Vocabulary. By E. A. Wallis Budge, Litt.D. (Cantab.), Keeper of the Egyptian and Assyrian Antiquities in the British Museum. Pp. liv + 592. (London: Kegan Paul, Trench, Trübner, and Co., 1896.)

Some Account of the Collection of Egyptian Antiquities in the possession of Lady Meux, of Theobald's Park, Waltham Cross. By E. A. Wallis Budge, Litt.D., &c. Pp. xii + 361. (London: Harrison and Sons, 1896.)

THOSE who remember the profound excitement caused by the appearance of Bunsen's "Egypt's Place in Universal History," and who now take up such a book as Dr. Budge's "Reading Book," will be surprised at the advance the study of Egyptian hieroglyphics has made since that time. Egyptology, in fact, is now on a footing of permanence which its best friends would have despaired of seeing a few years ago, and not only does it rouse the interest of the archæologist and the historian, but the student of folk-lore and of comparative religion, in his search for data, is beginning to lay under contribution its numerous legendary and mythological texts. To such a student a knowledge of the language, however slight, is of great value, as it enables him to control to some extent the translations on which he depends for information, and in many cases to understand the necessary limitations of a rendering into any modern idiom. To attain to even so slight a knowledge has been for many years extremely difficult for the beginner without the aid of a teacher, and only possible after a somewhat heavy initial expenditure in books. Last year, however, it was our duty to call attention to the publication of an extremely serviceable handbook or introduction to the study of the Egyptian language, entitled, "First Steps in Egyptian," by Dr. Wallis Budge, and it is with pleasure that we now note the appearance of a sequel to that volume in the form of a "Reading Book" by the same author, containing a series of complete texts for study. In 1888, Dr. Budge first printed these texts, and, although they appeared without

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